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ABSTRACT

The progression through the developmental stages of the acquisition of interrogatives was analyzed. Data on use of the "what" interrogative were collected during play sessions from eight children at six-month intervals from the ages of 1;6 to 3 years. More than 2,400 children's interrogatives were recorded. It was demonstrated that children's active analysis of formulas plays an important role in their discovery of syntax. A six-stage process is identified by which children progress from early interrogatives used as unanalyzed speech routines to the use of analyzed formulas and interrogative frames. This gradual process must be repeated for each interrogative word. Although early interrogatives may sound correct, they are limited and rigid in both form and use and subject to errors even after a period of seemingly correct production. The analysis necessary to recognize abstract linguistic rules is performed by children in gradual stages. (RW)

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THE DEVELOPMENT OF CHILDREN'S INTERROGATIVES: FROM FORMULAS TO RULES

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In 1965, Ursula Bellugi gave us a fascinating account of the development of Adam, Eve and Sarah's interrogatives. This story is very interesting and informative, but leaves some important questions unanswered. The one that concerns me here is a developmental one: How do children get from stage to stage? Bellugi's account implies a fairly sharp qualitative discontinuity between the earliest stage, when children use unanalyzed wh-formulas, and Period C, when their interrogatives can be described by transformational rules. My study addresses the nature of this transition. I would like to convince you, with a fine-grained analysis of a subset of children's interrogatives, that children's active analysis of formulas plays an important role in their discovery of syntax.

The data for my study are all the questions asked in five play sessions by each of eight children, a girl and a boy at each six-month age interval from 1;6 to 3;0. The subjects were all normal, first-born, middle-class children from homes where only English was spoken. Play sessions were audio and video-recorded under optimal conditions in a livingroom setting in a television studio. Interaction was almost exclusively between mother and child, although I participated when it seemed most natural to do so. Analysis is based on over 2,400 child interrogatives, all transcribed in IPA and interpreted with the support of the video recordings. Stages I-V (Brown 1973) are all represented in this study, although unequally, with between four and ten sessions per stage; see table 1.

The children in this study approached the task of learning interrogative syntax in a very systematic way, through very small increments. The two youngest did not go beyond the stage of using single words with rising intonation during the observation period. The other six children readily used interrogatives before they controlled adultlike rules for constructing them. Each development on the way to mature syntax was a reasonable, small step from the

Table 1. BROWN'S STAGE OF SYNTACTIC DEVELOPMENT (I-V) AS DETERMINED BY MLU AND UPPER BOUND, FOR EACH SUBJECT BY SESSION

	Session				
Subject	1	2	3	4	5
Benjamin	pre-I	pre-I	pre-I	pre-I	pre-I
Pieta	pre-I	pre-I	pre-I	pre-I	pre-I
Chloe	I	I	I	I	I
Graham	I	I	II	II	III
Darcy	II	II	III	III	III
Jane	III	III	III	IV	IV
Anthony	III	III	III	IV	V
Lindsay	IV	V	V	V	V+

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last development. The overall path of development is best described as the gradual extension and analysis of formulas and formulaic frames. A formula is a phrase or sentence of invariant composition stored and used as a ready-made whole. Its meaning is situation-bound and carried by the whole phrase. The story can be told in the form of a series of hypotheses:

A. Early wh-interrogatives are learned as unanalyzed speech formulas tied to a small set of interaction routines.
B. Once learned, these formulas become "old forms" available for new functions. New functions are both semantic (i.e. use of the formulas in new situations removed from the original interaction routines) and structural (i.e. use of the formulas as combining forms).
C. Wh-formulas then provide material for structural analysis and are gradually broken down into their constituent parts.
D. When wh-words are segmented from the frames in which they were learned, they are assigned a lexical semantic entry and participate in creative syntactic constructions.
E. As children segment linguistic units from interrogative frames, they begin to make generalizations about word classes and the behavior of these classes.
F. After the formulas and frames have been analyzed, some will remain in the child's repertoire as collocation-size units.

These hypotheses were motivated by a very thorough review of the question-acquisition literature and by similar observations in other domains of child language by other investigators, such as R. Clark (1974, 1977), Ferguson (1976), L. Fillmore (1979), Macken (1979), Peters (1980), Snow (1981) and Vihman (1980). The data from my study provide clear support for this general pattern of development, despite the fact that some hypotheses are more strongly supported than others. I will limit the discussion to *what* interrogatives, but similar results are available for *where*, *who* and *how*, and some types of yes/no interrogatives (Johnson 1981).

Results and Discussion

Hypothesis A is supported by data from Chloe, who was closest to the stage it describes. Even Chloe had begun to extend *what's that*--her single *what* formula--to situations beyond specific interaction routines, but structurally it was a true unit phrase. It permitted no lexical substitutions, and the *what* was pronounced less than half the time. When it was pronounced, it was never phonetically accurate; Chloe's mother interpreted tokens as far off the mark as [ɪʤæ] as *what's that*. The relative frequency of such formulas for the other children at stages I, II and III also provides support for this hypothesis. The simple, unadorned *what's that* and *what's this* together accounted for 69.7% of the children's 581 *what* interrogatives. Many of these, in fact nearly a third of all utterances interpreted as *what* interrogatives, lacked any phonetic trace of the word *what*

(e.g. [sɤt], [sɪs]). What's that and what's this were asked in a number of communicative situations, but could be predicted to occur in particular activities--such as reading books and pulling plastic animals out of a purse--with great reliability.

Evidence for hypothesis B is both semantic and structural. Interrogatives that sounded well-formed but somehow inappropriate to the situation support the claim that old forms were being used to express new meanings. A number of these occurred, though just two are presented here. In example 1 Graham asked what's that when an adult in such a conversation surely would have asked what color is that.

1. Graham (2;4.20, stage III)

M: What color's that one?

G: That's a green one.

M: Don't think so.

G: [wʌsɤt]

M: Looks like red to me.

Lindsay (3;2.8, stage V), unable to fit a section of plastic pipe onto a structure made from similar pieces, held up the offending section and asked what's that, when something like why won't this piece fit would have been more to the point.

Evidence that an old form is being put to a new structural use is the extension of the formulas, which remain internally intact, by new material added at the end. L. Fillmore (1979) observed this phenomenon among Chicano children learning English as a second language. For example, one child used the unanalyzed phrase how do you do dese frequently and without variation for a period, then extended it by addition, producing utterances like how do you do dese flower power and how do you do dese little tortillas. The full range of what interrogative types fitting this description is presented in 2-10. Note that representing these utterances in standard English orthography seriously overinterprets their internal grammatical structure. This problem is very hard to avoid, as the many overly powerful descriptions of early interrogatives in the child language literature demonstrate.

2. What's this one?
3. What's this thing?
4. What's that car?
5. What's that over there?
6. What's that called?

I. $\left\{\begin{matrix}\text{what's that}\\ \text{what's this}\end{matrix}\right\}\left(\left\{\begin{matrix}\text{one}\\ \text{thing}\\ \text{N}\\ \text{locative}\\ \text{called}\end{matrix}\right\}\right)$

7. What's that thing right here?
8. What's this one say?
9. What's that one is all finish?
10. What's this thing you make?

II. $\left\{\begin{matrix}\text{what's that}\\ \text{what's this}\end{matrix}\right\}\left(\left\{\begin{matrix}\text{one}\\ \text{thing}\\ \text{N}\end{matrix}\right\}\right)\left(\left\{\begin{matrix}\text{loc.}\\ \text{VP}\\ \text{S}\end{matrix}\right\}\right)$

I have schematized the generalizations in my data with paradigmatic frames, I-VI. I do not claim that these frames have any psychological validity as rules for the children, but I do claim that some sort of distributional analysis--which the frames illustrate--is

an important part of the progress from formulas to rules. This schematization also clearly shows that, considering frames I-IV, each frame is only a little more complex than the one that preceded it. So far, the frames represent only gradations of complexity; later I will consider them from a developmental point of view.

As presented, the frames do not look like well-formed rules, partly because they do not accurately indicate co-occurrence restrictions. Also, as simple as they are, they overpredict the interrogatives actually produced by any single child. For example, looking at frame I, only two children asked what's this called (but they asked this frequently). Locatives were limited to a few deictic phrases, such as over there and right here, and only a dozen or so interrogatives of the type indicated in example 4 occurred in the data. Some of these latter also count as semantic extensions, for example Anthony's [wʌtsɚt/wʌtsɚtkar/tsəbʌs?], where he apparently meant something like what kind of vehicle is that, a bus?

Notice that sentences 7 and 8 look like minor rearrangements of elements already present in sentences 2-6; 9 and 10 look like complex sentences, but are almost certainly juxtapositions of the type described by Clark (1974). In any case, it is a small step from frame I to frame II. (II is written in a way that includes description of sentences 2-6.) However, this is again too general, and at this point there is no evidence of analysis of what's this or what's that into smaller units. In fact, obvious segmentation errors, such as Graham's [wʌstɚt] and [wʌsɚtdɚwʌn], argue against it. Frames I and II account for 9.4% of the children's what interrogatives.

Addressing hypothesis C, we see some evidence for the analysis of these formulas in examples 11-27.

11. What's these?
12. What's those?
13. What's in here?
14. What's a shape?
15. What's your name?

III. what's ({that / this / those / these / NP}) ({locative / VP / S})

16. What is it?
17. What is this?
18. What is that?
19. What're those?
20. What're those here?
21. What are they?

IV. what {'s / is / are / 're} ({that / this / those / these / NP}) ({loc. / VP / S})

22. What you do?
23. What we do with this thing?
24. What we do with this, Mom?
25. What're we gonna do?
26. What we make, Mommy?
27. What we making?

V. what({'s / 're})Pro(gonna)do(with this... {thing / Mom})

VI. what Pro make(ing) (Mommy)

In 11-15 this and that have yielded to these and those or are missing altogether. However the new material in such interrogatives is very

limited in variety, and again frame III is too powerful. In 16-21 final [s] appears to have been segmented from what. Attribution of such segmentation is not warranted in all of these examples however. For example, Graham said something like [wʌʔardei] twice but did not use are in any other sentences. It is likely that this was just another formula for him. This is probably true of other examples as well, but evidence is hard to come by. The stacking up of just slightly differing formulas relevant to the same semantic/pragmatic domain may well provide the child with strong clues to boundaries and paradigmatic classes, which can then be reorganized in a deeper way as the child approaches adult syntax.

Without going through the details of these sentences, I will repeat that even these very limited paradigmatic frames overpredict the child's what-interrogatives. In all of the examples discussed so far, the only main verb has been copular be. The verb choice beyond this in what questions was restricted to a few examples of do and make (22-27, frames V and VI), and happen in five identical productions of what's gonna happen by a single child in one five-minute period.

With frames I-VI we have accounted for over 95% of the children's what interrogatives, a surprising result since we have a number of sessions with children at stages III, IV and V. This result was not an artifact of the observational setting, because the children used these limited forms when more creative queries were called for.

So far I have said nothing explicit about the developmental status of the frames, though it is obvious that I have been thinking about them in developmental terms. I have attempted to infer development by positing an implicational order: frame IV implies frame VII implies frame II and so on down to the simple what's that. This claims, for example, that a child who produces interrogatives from frame II will also use frame I-type interrogatives; no child should produce interrogatives of an implicationally higher level before

Table 2. SUMMARY OF WHAT-FRAMES AT EACH DEVELOPMENTAL STAGE

	Stage					
Frame Types	I	II	III	IV	V	T
What's that	107	78	82	13	2	282
What's this	6	20	68	26	3	123
Frame I	5	11	20	7	5	48
Frame II	...	3	3	...	1	7
Frame III	...	4	11	6	3	24
Frame IV	2	13	8	...	2	25
Single word what	...	...	4	2	...	6
Missing or uninverted AUX or Copula	...	...	5	8	7	20
Unframelike what-Q	...	1	1	2	3	7
Frame V	2	...	9	...	4	15
Frame VI	...	...	4	...	...	4
What's gonna happen	...	...	5	...	...	5

interrogatives of a lower level are attested. The distribution of interrogative types according to this implicational ordering is presented by stage in table 2. The table does not show the tidy progression described, but is supportive in some ways. What's that is clearly the earliest and most frequent form, and what's this ranks second. A greater variety of forms appears as the children mature, particularly around stage III. The most highly analyzed forms do not occur until the formulas are used as combining forms (frames I and II) and the frames showing the first analytic steps (that is, frames III and IV) are attested. The untidiness of the table at least partially reflects individual differences, as well as the likelihood that some additional formulas were counted as analyzed forms.

With reference to hypothesis D, after analysis has taken place wh-words are free to occur as contingent single-word queries. An example from Lindsay is what? in response to her mother's "I see something over there." At this point interrogative sentences can look much less correct than they did before; just because the wh-word has been found, it doesn't mean that the correct syntax will then automatically apply. A few queries like what to make occurred, demonstrating this point.

Unfortunately, the children in this study did not get old enough to provide evidence for the hypothesis that children generalize about word classes and their syntactic behavior. Their use of copula and auxiliary forms was very spotty and idiosyncratic during the period of observation. Surely it is premature to say that these children have a true auxiliary system, though I realize we need more than production data to assess this.

The final hypothesis deals with the formulaic residue once analysis has taken place. Several children provided clear evidence for this hypothesis, mainly in the form of collocation-mixing (Bolinger 1977). For example, Darcy (2;6.23) asked [wʌtsit] tea? instead of his ritual want some tea? Jane (2;8.30), in a session after one in which she repeatedly and carefully asked where as a single-word query, produced the following sequence of utterances (interspersed with maternal replies) while she tried to fit shapes into a Tupperware ball. In these utterances, what's this and where's this one go are mixed.

[wʌsðɪswʌngɔmam]
[wədɪwo]
[wəsdɪswʌŋgɔmam/ɪnhɪr]
[wʌtsdɪswʌŋgɔmam]
[ɪdɪswʌn]
[wʌsɪswʌngɔmam]
[wʌsdɪswʌn/gɔmam]
[wʌdɪswʌn]
[wʌsdɪtswʌn]
[wʌsɪfəŋgo]
[ʌsðɪsfowʌn]
[wʌsdɪswʌn]
[owasdɛ]
[wʌtsɪswɑ̃gɔmam]
[ʌtsjɛ/wʌtsədæt ʃarpsɪŋgɔmam]
[wʌsɪswʌn/gɔ]
[wʌsɪsðəwanəgɔ]

After plodding through 581 what interrogatives, what can we conclude about the acquisition of interrogative syntax, and syntax in general? One conclusion is that, regardless of the special

genetic predisposition children may bring to this task, it involves a lot of hard work. Analysis--which is necessary before children can recognize abstract classes that participate in rules--seems to be done very gradually, in little steps. Also, it is limited to a very small domain. For example, the children in my study had to do the whole job over again, slightly later but just as gradually, for where, and for want and see interrogatives without wh-words. This is the kind of very detailed problem-solving Annette Karmiloff-Smith talked about in her keynote address (this volume). This indicates that significant restructuring must take place before the child has generalizations at a high enough level to call interrogative syntax.

To put this a little differently, we can conclude that it is dangerous to attribute adultlike knowledge of interrogative syntax to children whose interrogatives sound adultlike in the early years. Although easy on the ear, these interrogatives tend to be very limited and rigid in both form and use. Of particular interest here are what Melissa Bowerman (1982) has called "late onset errors," errors which start to appear only after a considerable period of seemingly correct production.

An interesting observation which I have not yet stated explicitly is, that although children appear to adopt wh-formulas as successful communicative strategies in very particular interactional contexts--that is, this aspect of acquisition appears to be pragmatically driven--the analysis itself is purely formal. There is no pragmatic or semantic reason to break down whats into what and s.

If grammatical analysis proceeds at least partly in the way I've described--and, of course, this description taken by itself is orders of magnitude too simplistic--we should ask why formulas are particularly useful in the task of discovering grammar. Lily Fillmore (1979), among others, has suggested that a sentence represented in the child's own mind is easier to subject to analysis than one simply going by in speech.

Another possibility was suggested to me by Talmy Givón's recent work (1979). Using evidence from pidgins and creoles, language change, synchronic registers and child language, Givón claims to see a process of "syntacticization," a development from a pragmatic to a syntactic mode of communication. Changes in this development include the following: topic-comment word order grammaticalizes to subject-predicate; the noun to verb ratio within utterances increases; inflectional morphology develops, anaphoric pronouns appear; processing shifts from analytic to automatic and speed of delivery increases; and communication is extended beyond intimates, immediate contexts and shared knowledge. It may well be that formulas and frames not only provide the child with stored representations to work on, but also demonstrate "tight syntactic structures" to children who are otherwise communicatively juxtaposing words in "loose pragmatic structures." In other words, children's learning of restrictions on word combination and use of tying devices might well be facilitated by the existence of these syntactic features in prefabricated sentences.

As a final note, it is interesting that children provide evidence for producing certain interrogatives by formula rather than by rule

even after analysis has clearly been accomplished. This points to another kind of continuity between child and adult language. Bolinger (1976, 1977), C. Fillmore (1979), and a number of investigators in the fields of artificial intelligence and acquired aphasias have convincingly argued that a great deal of our fluency as fully competent adult speakers can be attributed to the storage and retrieval of whole, prefabricated phrases. Although we have the ability to generate each utterance from scratch, we do not always do so. Thus a fully adequate description of our language competence must encompass this finding. Discussion of formulas in children's language has, to date, been limited primarily to discussion of individual differences in language acquisition. I would like to argue that--while individual children may rely on formulas to a greater or lesser extent--all children actively make use of some formulas, and syntactic growth must be viewed in terms of the complementary procedures of breaking down large units and building up from one word at a time.

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